



TECHNICAL MEMORANDUM

To: Clint Meyer, AICP, Environmental Services Business Class Lead
Amy Lagerquist, Environmental Planner
HDR

From: Scott R. Noel, INCE AICP
Dillon S. Tannler
Claire A. Dossey

Date: 6/12/2026

Subject: Noise and Vibration Study for the Sewer Lift Station S7 Reconstruction Project – LBUD

Reference: 25-0069A

Executive Summary

As part of the proposed Sewer Lift Station S-7 Reconstruction Project (Project), the Long Beach Public Utilities Department (LBUD) within the City of Long Beach, California proposes to reconstruct lift station S-7 and install a new sewer force main connecting to LBUD's existing gravity sewer main. A recent condition assessment found the existing lift station unfit for long-term use and at imminent risk of failure.

Harris Miller Miller & Hanson Inc. (HMMH), under contract with HDR, conducted an environmental noise assessment for the construction and operation of the new lift station. The assessment evaluated facility noise levels relative to existing sound levels at noise sensitive receptors (i.e., residences) and evaluated compliance with the City of Long Beach Noise Element of the General Plan and the City's Noise Ordinance (Municipal Code 8.80).

HMMH used the 2024 version of the International Organization for Standardization (ISO) 9613-2 2024 sound propagation standard with the SoundPLAN® program to compute Project operational noise levels at noise-sensitive receptors. Existing station noise levels exceed the City of Long Beach exterior limits; however, with implementation of the Project, these exceedances would be eliminated except during emergency operations. Under emergency conditions, the backup power generator (enclosed without additional mitigation) may exceed the City's exterior limits. To address this, a low-noise generator with an enclosure approximately 12-feet in height should be incorporated into the Project. This approach would eliminate all adverse operational impacts.

Temporary construction noise and vibration were estimated using the methods outlined in the *Federal Transit Association (FTA) Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) and the Roadway Construction Noise Model (RCNM) for noise- and vibration-sensitive land uses (i.e., residences) in the study area (FHWA 2018). Noise from a temporary pump was also estimated using the same SoundPLAN model developed for the operational analysis. Short-term impacts are predicted to occur at the closest residential receptors, some less than 50 feet from construction or adjacent to the temporary pump. Mitigation is recommended to reduce noise exposure to these residences. The City of Long Beach Noise Element and Noise Ordinance set limits and hours for construction; night work would not occur as a part of this project when stricter limits apply. Short-term vibration impacts are predicted from impact pile driving and use of a vibratory roller. Recommended mitigation should be implemented to minimize noise and vibration impacts at nearby residences.

Contents

1.0	Introduction.....	4
1.1.1	Project Location and Setting	4
2.0	Applicable Noise Guidance	7
2.1.1	State of California	9
2.1.2	City of Long Beach Noise Element	10
2.1.3	City of Long Beach Noise Ordinance Section 8.8.....	10
3.0	Existing Noise Conditions	11
4.0	Predicted Project Noise Levels	11
	This section describes the noise prediction model, summarizes the input to the model, and presents the predicted operational noise levels and the results of the assessment.....	11
4.1.1	Noise Prediction Model	11
4.1.2	Noise Model Input.....	12
4.1.3	Presentation of Results	12
5.0	Construction Noise and Vibration	22
5.1.1	Construction Noise	22
5.1.2	Construction Vibration	26
6.0	Mitigation and Conclusion.....	26
6.1	Operational Mitigation.....	26
6.2	Temporary Construction Noise and Vibration Mitigation.....	26
6.3	Impacts after Mitigation	30
6.3.1	Operation	30
6.3.2	Temporary Construction	30
7.0	References	31

Figures

Figure 1.	Project Location	5
Figure 2.	Project Study Area	6
Figure 3.	Project Study Area Sensitive Land Uses.....	8
Figure 4.	Existing Daytime S-7 Operation	14
Figure 5.	Existing Nighttime S-7 Operation.....	15
Figure 6.	Future Typical Daytime S-7 Operation.....	17
Figure 7.	Future Typical Nighttime S-7 Operation	18
Figure 8.	Future Emergency Daytime S-7 Operation	20
Figure 9.	Future Emergency Nighttime S-7 Operation	21
Figure 10.	Temporary Pump Daytime Operation	24
Figure 11.	Temporary Pump Nighttime Operation.....	25
Figure 12.	Temporary Pump Daytime Operation	28
Figure 13.	Temporary Pump Nighttime Operation.....	29

Tables

Table 1.	Land Use Compatibility Guidelines for Community Noise Exposure	9
Table 2.	Exterior Noise Limits	10
Table 3.	Noise Measurements (dBA)	11

Table 4. Operational Source Levels.....12

Table 5. Construction Noise Levels.....23

Table 6. Construction Vibration Levels 26

Appendix

Appendix A: Measurement and Data Calibration..... 31

1.0 Introduction

As part of the proposed Sewer Lift Station S-7 Reconstruction Project (Project), the Long Beach Utilities Department (LBUD) within the City of Long Beach, California proposes to reconstruct lift station S-7 and install a new sewer force main connecting to LBUD's existing gravity sewer main. A recent condition assessment found the existing lift station unfit for long-term use and at imminent risk of failure. This memorandum serves to address noise associated with the construction and operation of the lift station at nearby noise-sensitive land uses in the project area.

1.1.1 Project Location and Setting

LBUD's existing Sewer Lift Station S-7 is located at 349 Lakeview Avenue in the Belmont Village/Belmont Park community of Long Beach, California (Figure 1). The Project extends north from the S-7 site along Lakeview Avenue and Marine Stadium Entrance Road to the existing sewer main point of connection (Figure 2). For the impact assessment, this document references a "Project Footprint" (approximately 5.2 acres), which includes anticipated construction limits and both permanent and temporary impacts. The Project Footprint covers the S-7 site and the adjacent right-of-way where the proposed force main would be constructed. This document also references a "Project Study Area" (approximately 46.3 acres), which includes the Project footprint along with adjacent areas within a 500-foot buffer. Both areas are shown in Figure 2.

The Study Area overlaps with the Belmont Park neighborhood and includes residences, public roadways, schools, parking lots, parks, open space, and public facilities. Marine Stadium, a manmade rowing course within the Alamitos Bay, lies northeast of the Study Area. Roadways in the Study Area include Monrovia Avenue, Lakeview Avenue, and Appian Way. Properties within the Study Area are zoned Residential (R-1-S), Park (P), Specific Plan (SP-2-CMW, SP-2-OSR), and Institutional (I). The Local Coastal Program utilizes the 1989 Land Use Element of the General Plan rather than the Land Use Element adopted in 2019, as the 2019 Land Use Element has not yet been certified by the California Coastal Commission. As identified in the 1989 Land Use Element, areas within the Study Area are designated as Land Use Designation (LUD) 1 - Single Family, LUD 7 - Mixed Uses, LUD 10 – Institutions/Schools and LUD 11 – Open Space/Parks (City of Long Beach 1989)¹. The Project Footprint is also located within the Coastal Zone. The southwestern portion of the Project Footprint is regulated under Long Beach's Local Coastal Program (LCP; Long Beach 1980); the northeastern portion directly adjacent to the Marine Stadium is within the Coastal Commission Permit Jurisdiction.

¹ Upon certification of the 2019 LUE for properties in the Coastal Zone from the Coastal Commission, the Land Use PlaceTypes envisioned in the Study Area include Founding and Contemporary Neighborhoods and Open Space.

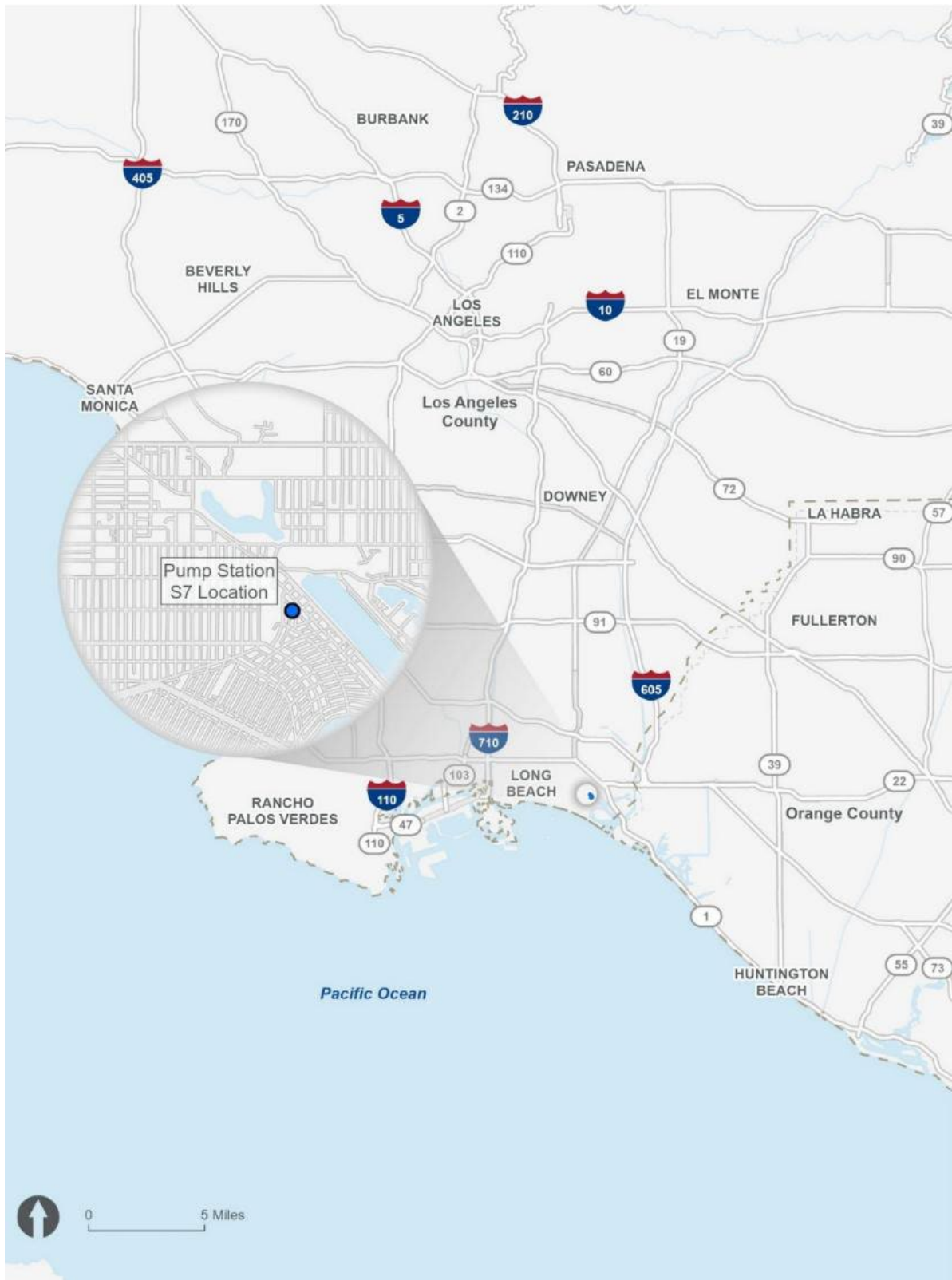


Figure 1. Project Location

Source: HDR, 2025

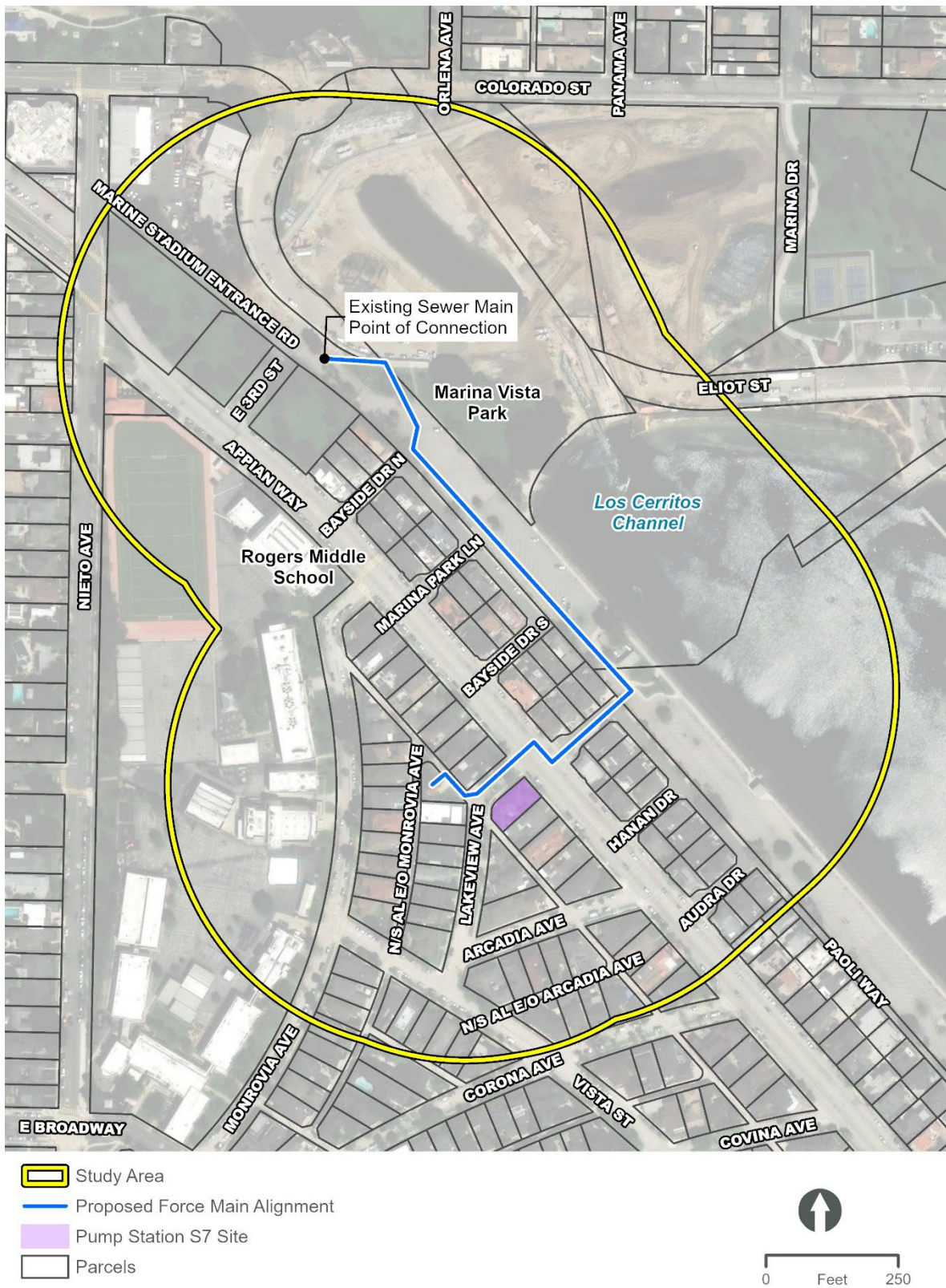


Figure 2. Project Study Area

Source: HDR, 2025



2.0 Applicable Noise Guidance

The Project is located within the City of Long Beach, California and is owned and operated by LBUD. Long Beach enforces noise compatibility through a Noise Element of their General Plan (City of Long Beach 2023) and noise ordinances within the Long Beach Municipal Code (City of Long Beach 2025). Sensitive land uses relative to the Project Footprint are shown on Figure 3.

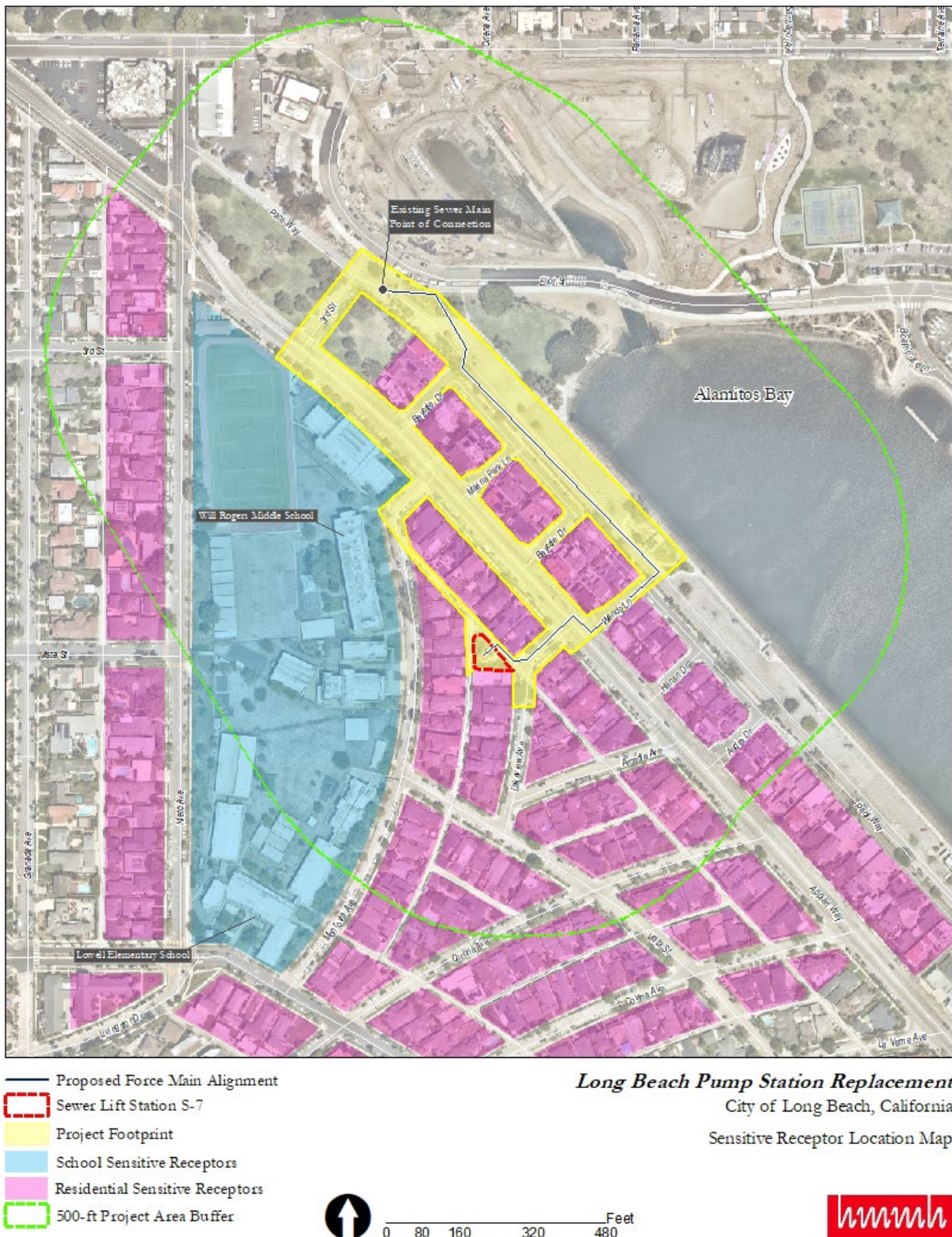


Figure 3. Project Study Area Sensitive Land Uses

2.1.1 State of California

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. California Government Code Section 65302(f) requires every county and city to adopt a comprehensive general plan that includes a noise element. The element must (1) identify and assess noise problems in the community; (2) incorporate Office of Noise Control guidelines; and (3) analyze and quantify current and projected noise levels. It must follow guidelines from the Governor’s Office of Planning and Research (OPR), which include suggested land use noise compatibility levels. These guidelines help planners evaluate whether land uses are compatible with existing and future noise levels. Compatibility is categorized into four levels: “normally acceptable,” “conditionally acceptable,” “normally unacceptable,” and “clearly unacceptable.” For instance, a noise environment ranging from 50 dBA Community Noise Equivalent Level (CNEL) to 65 dBA CNEL is considered to be “normally acceptable” for multi-family residential uses, while a noise environment of 75 dBA CNEL or above for multi-family residential uses is considered to be “clearly unacceptable. These guidelines are advisory and inform land use decisions such as zoning modifications. In addition, the State through California Environmental Quality Act (CEQA) requires analysis of all known environmental effects of a project, including noise impacts.

Consistent with the OPR guidance, the City of Long Beach has established land use compatibility guidelines for determining acceptable noise levels for specific land uses. **Table 1** summarizes these standards for use in planning and policy decisions.

Table 1. Land Use Compatibility Guidelines for Community Noise Exposure

Land Use Category	Community Noise Exposure (CNEL, dBA) ¹			
	Normally Acceptable ²	Conditionally Acceptable ³	Normally Unacceptable ⁴	Clearly Unacceptable ⁵
Residential-Low Density Single-Family, Duplex, Mobile Homes	<60	55 – 70	70 – 75	75<
Residential Multi-Family	<65	60 – 70	70 – 75	75<
Transient Lodging-Motels and Hotels	<65	60 – 70	70 – 80	80<
Schools, Libraries, Churches, Hospitals, Nursing Homes	<70	60 – 70	70 – 80	80<
Auditoriums, Concert Halls, Amphitheaters	-	50 – 70	-	65<
Sports Arenas, Outdoor Spectator Sports	-	50 – 75	-	70<
Playgrounds, Neighborhood Parks	<70	-	68 – 75	73<
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75	-	70 – 80	80<
Office Buildings, Business Commercial, Professional	<70	68 – 78	-	75<
Industrial, Manufacturing, Utilities, Agriculture	<75	70 – 80	<75	-
Definitions: CNEL = Community Noise Equivalent Level; Ldn = Day/Night Average; NA = Not Applicable Notes: 1. CNEL represents the typical long-term noise environment, including mobile sources such as traffic and aircraft and stationary sources, such as pump stations. CNEL generally excludes temporary or short-term construction noise. 2. <u>Normally Acceptable</u> : Specified Land Use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. 3. <u>Conditionally Acceptable</u> : New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice. 4. <u>Normally Unacceptable</u> : New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. 5. <u>Clearly Unacceptable</u> : New construction or development should generally not be undertaken.				

2.1.2 City of Long Beach Noise Element

On June 6, 2023, the City of Long Beach adopted a revised Noise Element (2023 Noise Element) replacing the previous Noise Element from the 1975 General Plan (1975 Noise Element). The 2023 Noise Element identifies several policies and strategies to minimize the impacts of excessive noise levels throughout the community and establishes allowable noise exposure levels from transportation sources for all land uses. The 2023 Noise Element includes strategies and policies to reduce construction noise impacts. Policies N 12-1 through N 12-7 include measures to reduce construction noise at the source, reduce noise conflicts, limit the allowable hours for construction activities near sensitive uses, establish noise level standards based on PlaceType as part of the City's Municipal Code, and encourage construction best practices that reduce noise (City of Long Beach 2023).

2.1.3 City of Long Beach Noise Ordinance Section 8.8

The City of Long Beach regulates noise through the Long Beach Municipal Code (LBMC) Section 8.80, which establishes exterior and interior noise limits based on land use and sound characteristics (City of Long Beach 2025).

- **LBMC Section 8.80.150, Exterior Noise Limits – Sound levels by receiving land use district:** Specifies allowable sound levels by land use district. If ambient noise exceeds the standard, the permissible limit is increased in 5 dB increments to reflect existing conditions.
- **LBMC Section 8.80.160, Exterior Noise Limits – Correction for character of sounds:** Provides adjustments for certain sound characteristics. The Project site falls within District One, as shown in **Table 2**. Exterior limits may be increased by 5 dB if existing sources already exceed thresholds.

Table 2. Exterior Noise Limits for Operation

Receiving Land Use District ¹	Time Period	Noise Level ¹ (maximum)
District One ²	Night: 10:00 p.m.-7:00 a.m.	45
	Day: 7:00 a.m. – 10:00 p.m	50
District Two	Night: 10:00 p.m.-7:00 a.m.	55
	Day: 7:00 a.m. – 10:00 p.m	60
District Three	Any time	65
District Four	Any time	70
District Five	Regulated by other agencies and laws	

Note:

¹ Districts Three and Four limits are intended primarily for use at their boundaries rather than for noise control within those districts.

² The Project site falls within District One.

- **LBMC Section 8.80.202, Construction Activity – Noise Regulations:** States allowable hours for construction. LBMC has not established quantitative standards for construction noise but does regulate allowable hours of construction. All construction must occur outside of the hours of 7:00 p.m. to 7:00 a.m., Monday through Friday, and federal holidays occurring on weekdays. Construction equipment operation shall only be permitted outside of the hours of 7:00 p.m. on Friday and 9:00 a.m. on Saturday and after 6:00 pm on Saturday. Construction work shall not be conducted on Sunday. To perform construction on Sundays, only between the hours of 9:00 a.m. and 6:00 p.m., a Sunday work Permit must be issued by the Noise Control Officer.

As the City of Long Beach has not adopted a numerical construction noise threshold, the criteria from the Federal Transit Administration (FTA) Transit Noise and Vibration Manual are used to establish significance thresholds for this analysis. The FTA provides reasonable criteria for assessing construction noise impacts based on the potential for adverse community reaction. The FTA Transit Noise and Vibration Manual identifies a maximum 8-hour noise level standard of 80 dBA Leq at residential uses and 90 dBA Leq at commercial and industrial uses for short-term construction activities.

3.0 Existing Noise Conditions

To aid in establishment of the current ambient noise in the Project Study Area, 24-hour measurements were completed simultaneously at two locations on the project site at the far north end of the lift station property and the southern mid-point of the project site near the residence at 345 Monrovia Avenue. Post processing of the measurement data was completed to identify when the existing pump was active. The purpose of this was twofold:

1. To identify the ambient sound levels in the vicinity of the lift station when the station is active and inactive.
2. To identify the proportion of time during the measurement effort that the equipment at the lift station was active to support the prediction efforts.

Table 3 summarizes the measured sound levels with and without S-7 operating.

Table 3. Noise Measurements (dBA)

Location	Scenario	Daytime Leq	Evening Leq	Nighttime Leq	CNEL ¹
M01 - Midpoint Near Lift station	Including S-7 Sounds	60	57	53	61
M01 - Midpoint Near Lift station	Excluding S-7 Sounds	58	48	42	56
M02 - Far North End	Including S-7 Sounds	60	53	47	58
M02 - Far North End	Excluding S-7 Sounds	57	53	43	56

Notes:

¹. CNEL is provided as the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly Leq for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours; City of Long Beach 2023).

Analysis of the measurement data indicates that the lift station is active 12 percent of the time during the day (7:00 a.m. to 7:00 p.m.) and early evening (7:00 p.m. to 10:00 p.m.) and 16 percent of the time at night (10:00 p.m. to 7:00 a.m.). These percentages were used in the predictions, assuming that the station will continue to be active approximately the same as it did during the measurement effort.

4.0 Predicted Project Noise Levels

This section describes the noise prediction model, summarizes the input to the model, and presents the predicted operational noise levels and the results of the assessment.

4.1.1 Noise Prediction Model

SoundPLAN® three-dimensional acoustic modeling software version 9.1 was used to complete the Project operational sound level predictions. An industry standard, SoundPLAN® was developed by Braunstein + Berndt GmbH to provide estimates of sound levels at distances from specific noise sources taking into account the effects of terrain features including relative elevations of noise sources, receivers, and intervening objects such as buildings, and ground effects due to areas of acoustically hard ground such as pavement or water, and acoustically softer ground such as grass.

The sound propagation standard used for this study is the latest version of ISO 9613-2 published in 2024. This international standard propagation is commonly used in the United States for environmental noise studies. The equations in ISO 9613-2 can be thought of as being “worst-case” in that it assumes a downwind propagation condition in all directions (ISO 2024).

4.1.2 Noise Model Input

The SoundPLAN predictions incorporate the existing baseline terrain, buildings, and acoustically hard surfaces such as roadways in the area. An existing conditions model was created to calibrate the model to approximate how the existing station operates. This was completed by comparing predicted sound levels from the existing model and logarithmically adding them to the measured baseline sound levels excluding the lift station. Generally, modeling is considered as agreeing with measured levels if they are within +/- 3 dB since this is the threshold that average human hearing has been found to be able to recognize a difference between two like sound sources. A comparison was made between the measured CNEL with the station active and the modeled station plus baseline without station active to determine if the model is an accurate predictor of the existing station. This comparison indicates that the existing modeled situation plus baseline without station active is within +/- 1 dB on a CNEL basis, demonstrating very close agreement.

The existing conditions model was adjusted to remove the existing station and include the equipment for the Project that is assumed to be dominant during operations. Two future scenarios were modeled, one under typical operations and one under emergency operations. The emergency operations represent the condition when the Project diesel generator would be active in addition to the future lift station pump equipment.

Source levels used in the existing and future station predictions are provided in **Table 4**. Each of these sources are assumed to be in operation during 12 percent of the daytime and 16 percent of the nighttime, as observed via monitoring at the existing station.

Table 4. Project Operational Source Levels

Source	Sound Power Level	Notes
Existing and Future Lift Station Mechanical Pumps	91.99 dB	Sound power level obtained from British Standard BS 5228-1:2009+A1:2014, Table C2 which states a sound pressure level of 65 dB at 10 meters (32.8 feet) for this equipment type. This level was adjusted to 91.99 LwA to correspond with the existing level measured at the station. LwA denotes the A-weighted sound power level of a piece of equipment or machinery representing the total acoustic energy radiated by a source in all directions and measured in dB. <i>Note: at this time the design has not identified what equipment will be installed at the Project station. Therefore, the modeling assumes the same sound source level, although in a different location and geometry, to what currently exists.</i>
Enclosed Backup Power Generator	97.89 dB	Generator source spectrum obtained from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) 2.0 Level II sound attenuation enclosure resulting in a 70 dBA Sound Pressure Level at 23-feet (7 meters)

4.1.3 Presentation of Results

Sound contour levels were calculated using SoundPLAN® and the levels of impact for daytime and nighttime operations under each scenario analyzed. The existing station sound contours relative to nearby homes are shown on **Figure 4** for daytime operations and **Figure 5** for nighttime operations as well as the locations of the noise measurements. As these figures show, the homes closest to the station experience levels in exceedance of the

City's exterior noise standards, which are 50 dBA Leq for daytime and 45 dBA Leq for nighttime. Because of this, the City's exterior noise limits are increased by 5 dB when assessing future impacts.

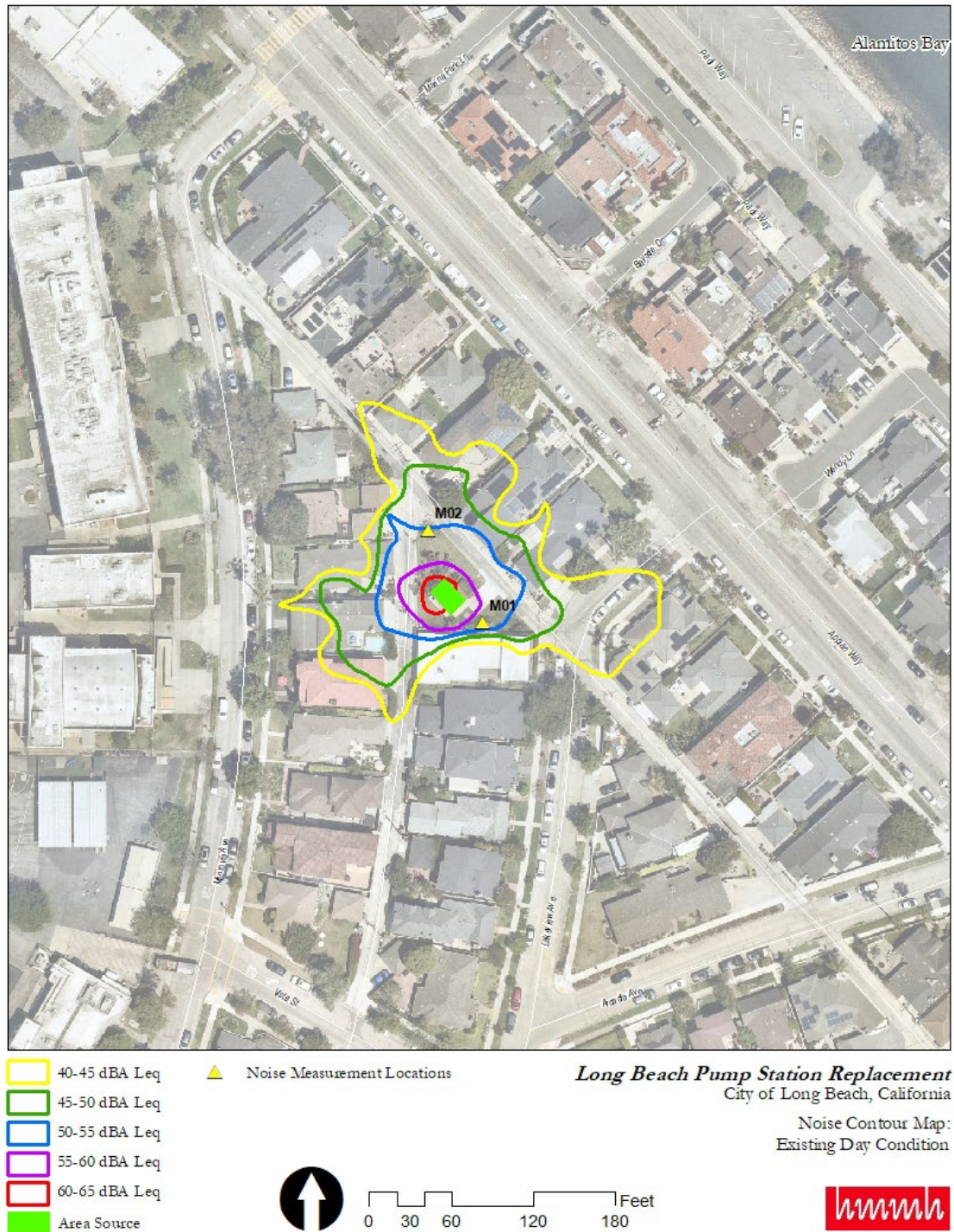


Figure 4. Existing Daytime S-7 Operation

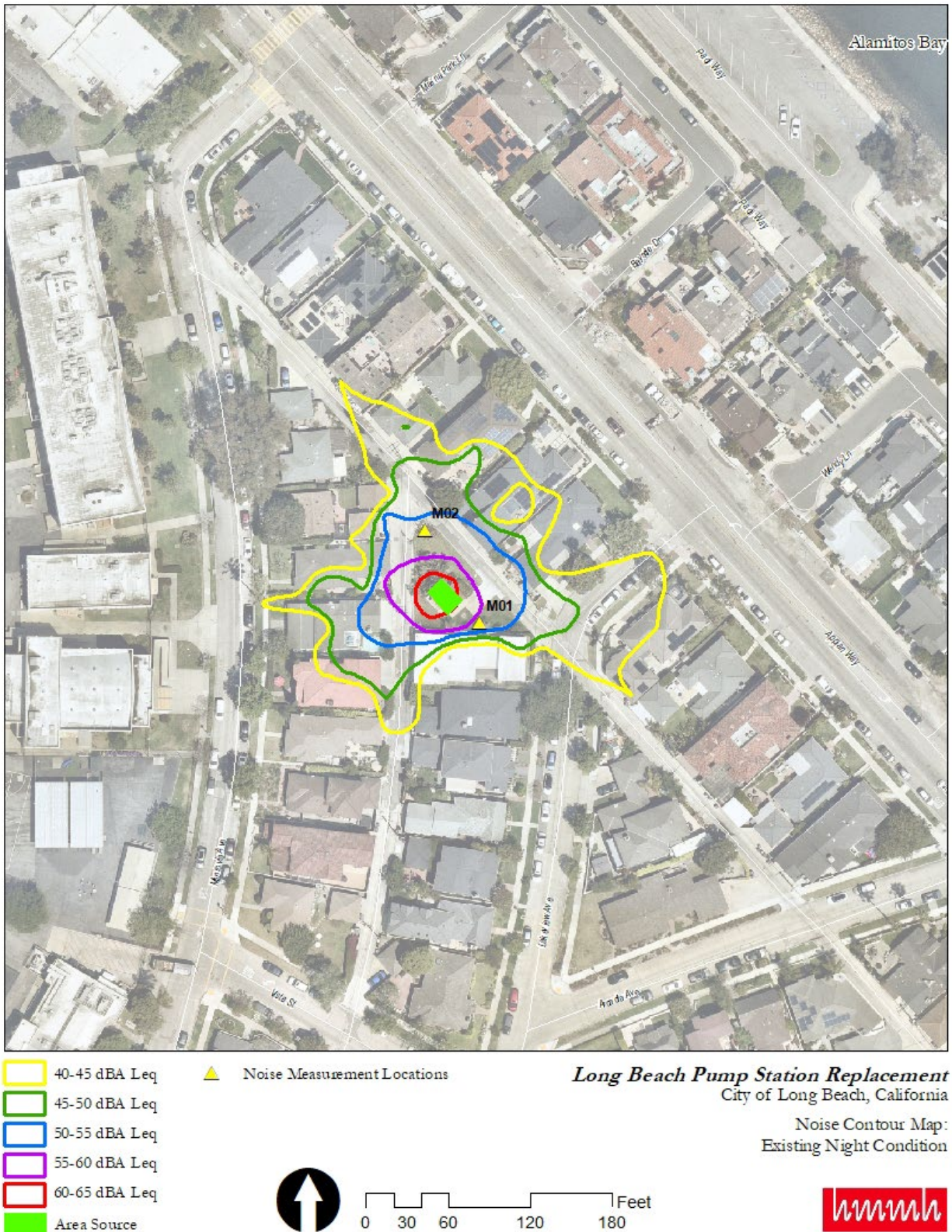


Figure 5. Existing Nighttime S-7 Operation

Future station sound levels are depicted on **Figure 6** for typical daytime operations and **Figure 7** for typical nighttime operations. Sound levels are lower in many areas since the noise producing equipment, such as pumps at the wet well, have been moved farther from some sensitive receptors and moved below grade, and therefore would be shielded more than the current station that has sound producing equipment located above grade. For all sensitive receptors, levels would be lower with the future station configuration. No significant impacts are anticipated from operation of the future station under typical operations.

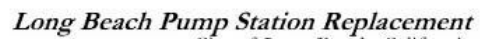


Figure 6. Future Typical Daytime S-7 Operation



Figure 7. Future Typical Nighttime S-7 Operation

Future station sound levels are depicted on **Figure 8** for emergency daytime operations and **Figure 9** for emergency nighttime operations. The wet well equipment would operate the same way it does in the typical operations. The only difference with this scenario is that an enclosed diesel power generator would provide power when the equipment at the station is active. A generator has not been identified at this point in the design; therefore, this analysis assumes an enclosure around a diesel electric generator would be implemented for the Project. For this analysis, the generator plus enclosure is assumed to produce approximately 70 dBA at 23 feet (7 meters) based on manufacturers specifications (Norwall Power Systems 2025). While not a typical operational scenario, when the generator is active it would exceed City thresholds even with the 5 dB allowable increase, which would be considered significant impacts absent mitigation.



City of Long Beach, California

Noise Contour Map:

Future Emergency Day Condition



Figure 8. Future Emergency Daytime S-7 Operation

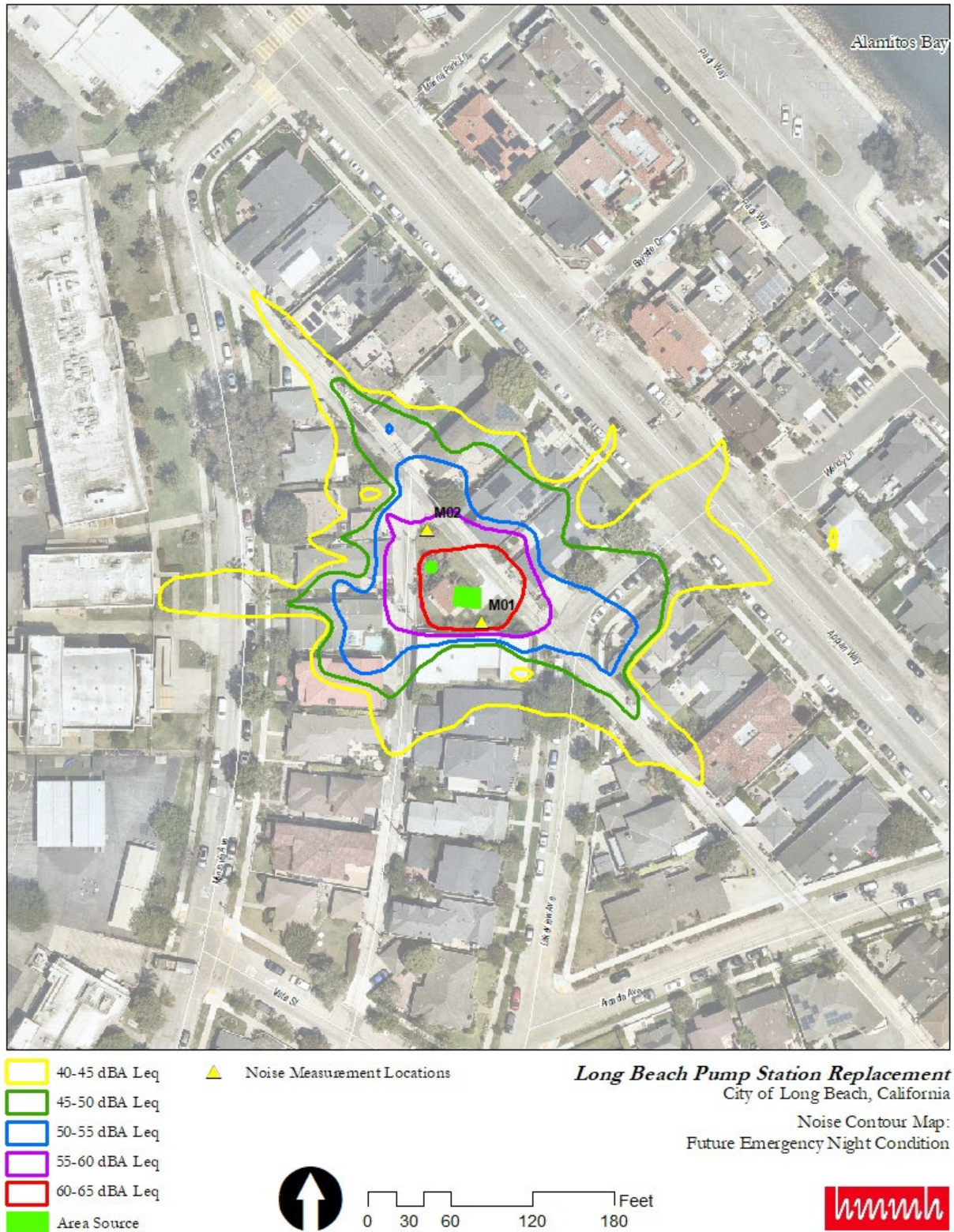


Figure 9. Future Emergency Nighttime S-7 Operation

5.0 Construction Noise and Vibration

Construction noise and vibration predictions were completed for the Project, and the results are summarized in the subsections that follow.

5.1.1 Construction Noise

Temporary noise from construction activity is generated by the broad array of powered, noise producing mechanical equipment used in the construction process and the noise resulting from use of a temporary pump while the lift station is offline. Construction equipment ranges from handheld pneumatic tools to excavators, loaders, a variety of trucks, and tie and rail handling equipment.

5.1.1.1 Construction Equipment Noise Analysis

To assess potential noise impacts from construction equipment, this noise analysis used the methodology in Section 7 of the *FTA Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Construction equipment noise exposure at a receiver location was calculated from the dB addition of all operating construction equipment using the equations and methodology described in the FTA manual (FTA 2018). For example, the attenuation rate used as a point source was 6 dB per doubling of distance. The intervening ground was hard surfaced; therefore, any additional reduction from ground effects was negligible. Shielding effects from intervening structures were ignored.

Construction equipment used in the analysis is typical of infrastructure projects such as dump trucks, front end loaders, rollers, mobile cranes, dozers, graders, and excavators. The range in noise levels typically generated by the equipment assumed for the analysis ranges from 74 dBA maximum sound level (L_{max}) (e.g., pickup truck) to 105 dBA L_{max} (e.g., impact pile driver) at a distance of 50 feet based on source levels from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). **Table 5** provides the source levels used in this analysis, the types and quantities of equipment, usage factors, and the composite dBA Leq at distances ranging from 50 feet to 500 feet. The mix of construction equipment by phase are the same as those identified in the Project description. The analysis assumes that all equipment for a given phase of construction is active simultaneously. This conservative assumption in the predictions, in combination with the anticipated construction equipment mix, indicates that a significant noise impact would occur in the absence of mitigation as a result of the construction effort because sound levels would exceed the FTA's threshold of 80 dBA Leq for construction in residential areas.

5.1.1.2 Temporary Lift station Noise Analysis

The temporary lift station for the project was also analyzed to identify potential impacts by implementing the same modeling methodologies used in the operational analysis. The only change in the analysis methodology was with the source level used for the temporary pump. For this assessment, the temporary pump is assumed to be the one identified in the FHWA RCNM, Version 2.0, with a source level of 105.5 dBA L_w. Significant noise impacts would occur from the use of a temporary pump. **Figure 10** and **Figure 11** are maps of the noise contours associated with temporary pump operation during daytime and nighttime, respectively.

Table 5. Construction Noise Levels

Phase	Equipment ^a				Composite Sound Level (Leq) at Distance ^c				
					Variable Distances (feet)				
	Type	Usage Factor	Quantity	L _{max} at 50 feet ^b	50	100	200	300	500
Demolition and Site Preparation	Jackhammer	20	1	95	90	84	78	75	70
	Concrete saw	20	1	88					
	Grader	40	1	79					
	Dozer	40	1	86					
	Loader	40	1	81					
	Pickup truck	40	1	74					
Excavation and Earthwork, Foundation and Structural Construction, Utility Installation, and Equipment Installation	Excavator	40	2	87	98	92	86	83	78
	Crane	16	1	76					
	Pumps	50	1	74					
	Impact Pile Driver	20	1	105					
	Compactor	20	1	82					
	Concrete mixer	40	1	82					
	Concrete pump	20	1	74					
Surface Restoration (Final Grading, Paving, and Landscaping)	Vibratory Roller	20	1	82	82	76	70	66	62
	Paver	50	1	82					
	Compactor	20	1	82					

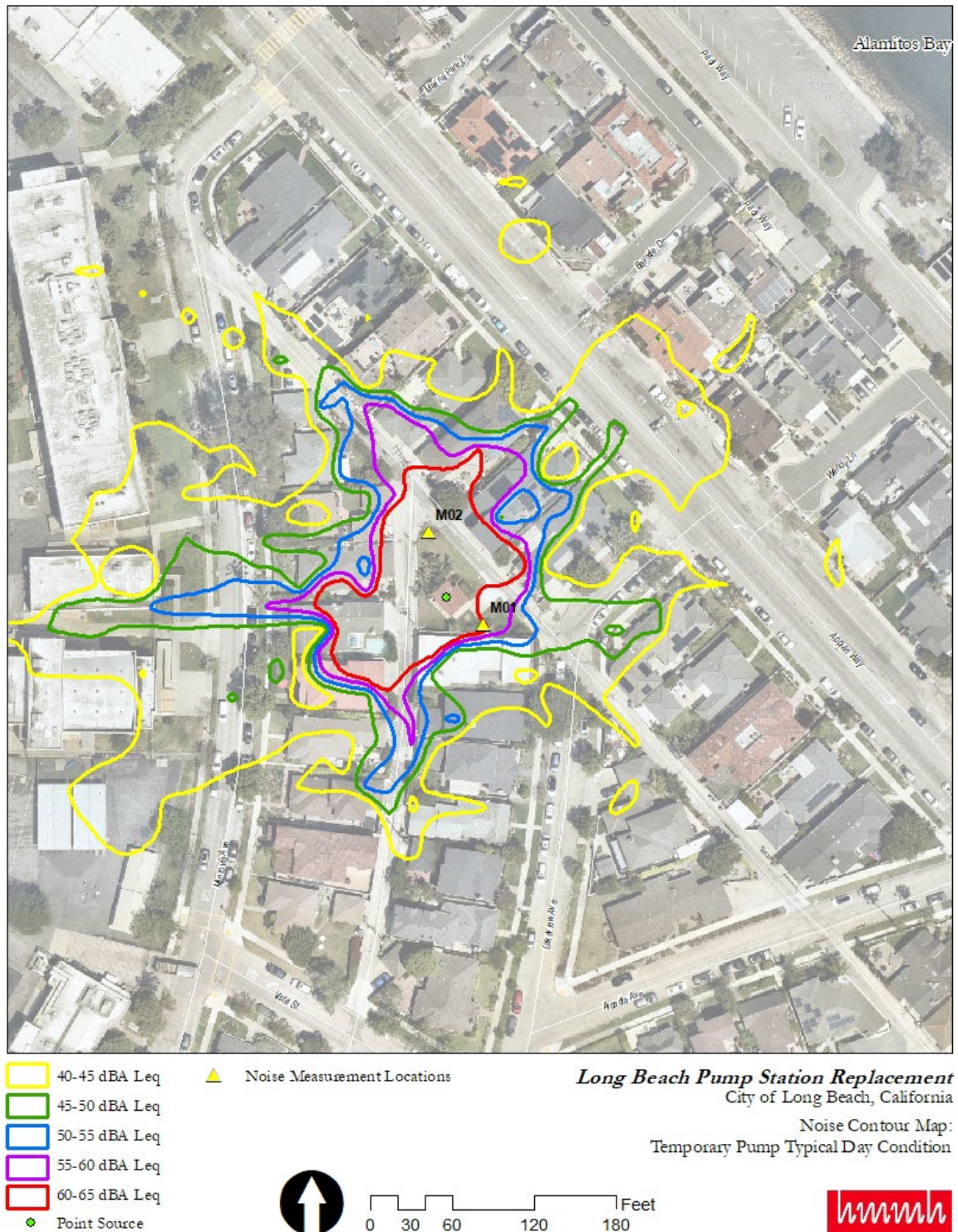
Notes:

^a Equipment obtained from Project Description in September 2025

^b Measured L_{max} at given reference distance obtained from the Federal Highway Administration Roadway Construction Noise Model, Federal Highway Administration 2018 and/or FTA Noise and Vibration Guidance 2018

^c Distance factor determined by the inverse square law defined as 6 dBA per doubling of distance as sounds travel away from an idealized point.

Leq=equivalent noise level; L_{max}=maximum sound level



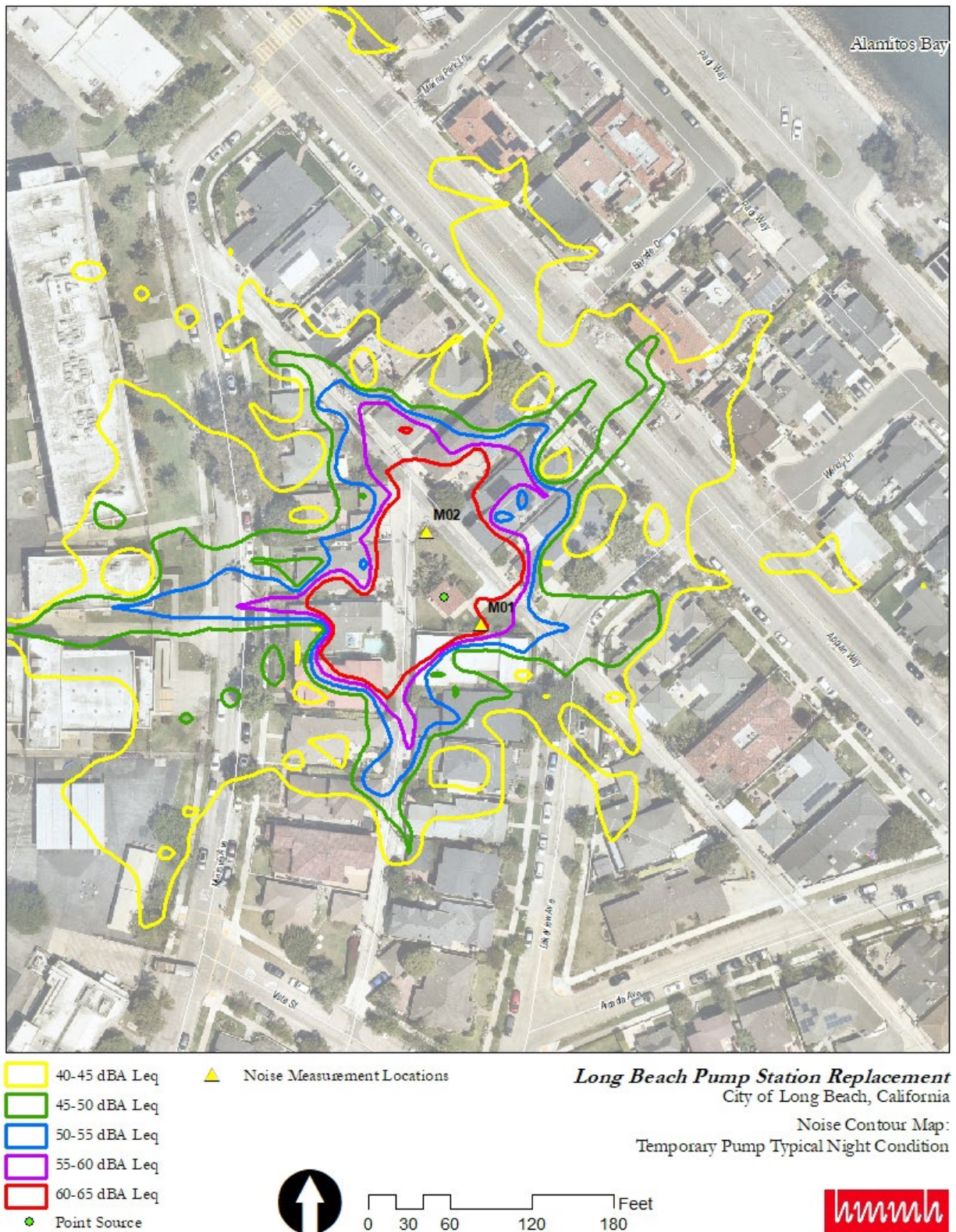


Figure 11. Temporary Pump Nighttime Operation

5.1.2 Construction Vibration

To assess potential vibration impacts from construction, this vibration analysis used the methodology contained in Section 7.2 of the FTA manual (FTA 2018). The potential for damage to structures from Project-related construction vibration was analyzed for the sensitive receivers. Vibration source levels for a variety of typical construction equipment types are outlined in the FTA manual. For this analysis, the source of typical vibration levels for a pile driver (0.644 inch per second peak particle velocity [PPV]) and a roller (0.210 inch per second PPV) were used to analyze impact conditions since they are the most vibration intensive. The buildings located near the construction effort are assumed to all be engineered structures that have a damaged threshold of 0.30 PPV. The annoyance criteria for the sensitive receptors (i.e., residences) near the Project is 80 VdB per FTA. There are several sensitive structures that would exceed the damage and annoyance criteria due to use of the impact pile driver. Use of the vibratory roller would not result in damage impacts but is predicted to result in annoyance. These impacts would be considered significant without mitigation.

Table 6. Construction Vibration Levels

Equipment	PPV at 25 feet (in./sec.)	VdB at 25 feet	50 feet		75 feet		100 feet		150 feet		200 feet		300 feet	
			PPV (in./sec.)	VdB	PPV (in./sec.)	VdB	PPV (in./sec.)	VdB	PPV (in./sec.)	VdB	PPV (in./sec.)	VdB	PPV (in./sec.)	VdB
Impact pile Driver	0.644	104	0.228	95	0.124	90	0.08	86	0.044	80	0.028	77	0.015	72
Vibratory roller	0.21	94	0.074	85	0.04	80	0.03	76	0.014	70	0.009	67	0.005	62

6.0 Mitigation and Conclusion

Implementation of the following mitigation measures would reduce the potentially significant impacts as a result of Project operation and construction to a level less than significant.

6.1 Operational Mitigation

Operational noise impacts are predicted to occur during the emergency operation of the lift station due to sound levels associated with the diesel generator. These levels would be mitigated by working with the generator manufacturer to ensure the enclosure includes additional exhaust muffling, enclosure attenuation such as baffles, and other methods. Since the specific generator and enclosure have not been selected yet, care should be taken to identify a generator/enclosure combination that produces levels no greater than 60 dBA at 23 feet (7 meters). Additionally, LBUD may consider an electric generator and/or pumps that generate less noise to further reduce noise levels.

6.2 Temporary Construction Noise and Vibration Mitigation

General Project construction noise and vibration would result in significant impacts. Additionally, the temporary pump needed for the project would result in significant impacts. The following mitigation is proposed to reduce these impacts to less than significant:

- Mitigation Measure NOI-1: Temporary Noise Barrier/Sound Blanket for Temporary Bypass Pump.** The operation of the temporary pump while the existing lift station is offline and the future lift station is being completed would result in noise impacts. Installation of a temporary noise barrier or sound blanket, estimated at needing to be approximately 12-feet in height, that would enclose the pump on all sides, except for the top, would reduce noise levels to similar levels as those experienced with the existing lift station in operation. **Figure 12** and **Figure 13** are maps of the temporary pump with implementation of a noise barrier/sound blanket for daytime and nighttime, respectively.

- **Mitigation Measure NOI-2: Comply with Noise Abatement Ordinance.** All construction contractors shall comply with the City of Long Beach construction noise ordinances and noise levels allowable based on current land use designation. Construction shall not be allowed between 7 p.m. and 7 a.m. Monday through Friday. Construction also shall not be allowed before 9 a.m. or after 6 p.m. on Saturday. No construction would occur on Sunday. Nighttime construction activities will be prohibited.
- **Mitigation Measure NOI-3: Employ Noise-Reducing Construction Practices.** Construction contractor shall identify and employ noise-reducing construction practices. This provision shall be reflected in contract documents. Measures that may be used to limit noise consistent with the Long Beach Noise Ordinance include, but are not limited to:
 - a. locating equipment as far a practical from noise sensitive uses,
 - b. using mufflers on all standard equipment and/or selecting quieter equipment (i.e. electric generators),
 - c. selecting haul routes that affect the fewest number of people,
 - d. using noise-reducing enclosures around noise-generating equipment,
 - e. constructing barriers between noise sources and noise-sensitive land uses or taking advantage of existing barrier features (terrain, structures) to block sound transmission, and
 - f. enclosing equipment.
- **Mitigation Measure NOI-4: Temporary Relocation of Residents.** During extremely noisy construction periods, the most effective mitigation strategy may be to provide temporary lodging for immediately adjacent, noise-impacted residents. By providing temporary lodging for the adjacent noise receptor(s), very loud activities will be completed in less time and when other noise-controlled procedures are infeasible. Under these circumstances, LBUD will provide hotel vouchers or other compensation for temporary lodging to the noise-impacted residents.
- **Mitigation Measure NOI-5: Vibration Monitoring.** The following measures shall be incorporated in all grading and building plans and specifications subject to approval of LBUD prior to issuance of a demolition or grading permit:
 - The contractor shall utilize a construction vibration monitoring system with the potential to measure low levels of vibration to minimize and avoid human annoyance and structural damage in accordance with local vibration standards. If the human annoyance criterion and the structural damage criterion are exceeded, construction must cease, and alternate strategies shall be employed in coordination with a qualified acoustic engineer.
 - Conduct sensitivity training to inform construction personnel about the existing sensitive receptors surrounding the project alignment and about methods to reduce noise and vibration.



- 40-45 dBA Leq
- 45-50 dBA Leq
- 50-55 dBA Leq
- 55-60 dBA Leq
- 60-65 dBA Leq
- Point Source

▲ Noise Measurement Locations

Long Beach Pump Station Replacement
 City of Long Beach, California

Noise Contour Map:
 Temporary Pump Typical Day Condition
 with Mitigation



0 30 60 120 180 Feet



Figure 12. Temporary Pump Daytime Operation

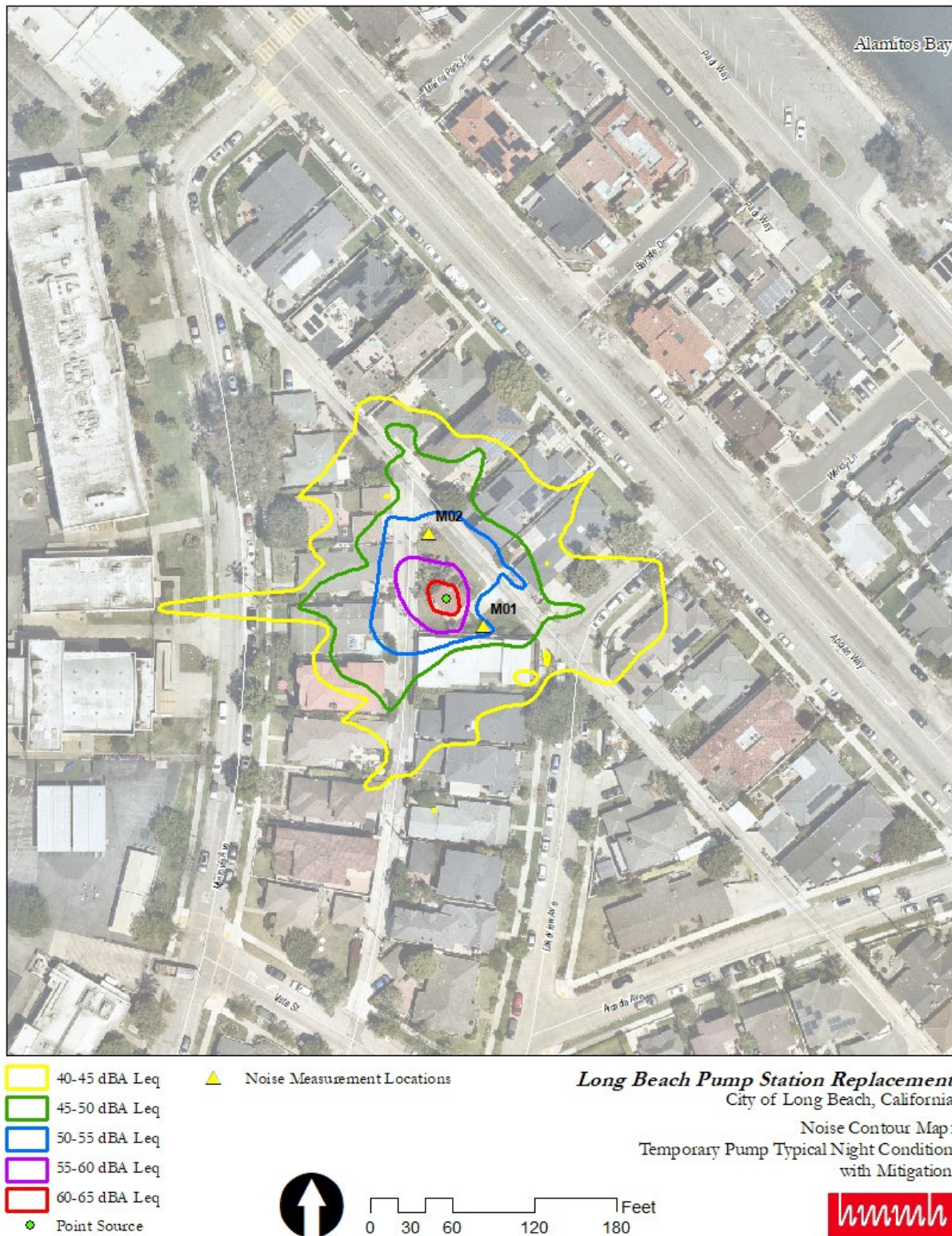


Figure 13. Temporary Pump Nighttime Operation

6.3 Impacts after Mitigation

6.3.1 *Operation*

Using a lower noise producing generator and enclosure combination would eliminate operational impacts. For this reason, no significant residual impacts or adverse effects would remain.

6.3.2 *Temporary Construction*

Implementation of the construction noise and vibration mitigation measures, including restricting the loudest activities to daytime periods, monitoring vibration levels, and implementation of the noise barrier or sound blanket around the temporary pump would reduce levels such that no significant residual construction impact or adverse effect would remain.

7.0 References

City of Long Beach. 1980. Local Coastal Program.

City of Long Beach. 1989. General Plan Land Use Element.

City of Long Beach. 2019. General Plan City of Long Beach. 2023. *Noise Element City of Long Beach General Plan*. June. <https://www.longbeach.gov/globalassets/lbcd/media-library/documents/planning/noise-element-update/noise-element>

City of Long Beach. 2025. Long Beach Municipal Code. https://library.municode.com/ca/long_beach/codes/municipal_code?nodeId=TIT8HESA_CH8.80NO International Organization of Standardization (ISO). 2024. ISO 9613-2:2024 Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors, <https://www.iso.org/standard/74047.html>.

Federal Highway Administration. 2018. Roadway Construction Noise Model User's Guide. <https://apps.trb.org/cmsfeed/trbnetprojectdisplay.asp?projectId=3889>.

Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment Manual*. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

Norwall Power Systems. 2025. Wildcat Renegade 10kW Diesel Generator 3-Phase Generator Specification. <https://norwall.com/products/wildcat-renegade-10kw-diesel-generator-120/240-volts-re0010d4/>

APPENDIX A. MEASUREMENT DATA & CALIBRATION



M01 – Midpoint Measurement Location – Photo 1



M01 – Midpoint Measurement Location – Photo 2



M02 – Corner Measurement Location – Photo 1



M02 – Corner Measurement Location – Photo 2



The Hottinger Brüel & Kjær Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770/209-6907
Fax: 770/447-4033
Web site address: <http://www.hbkworld.com>



Calibration
Certificate
Number
1568.01

CERTIFICATE OF CALIBRATION

Certificate No: 439814-101

Page 1 of 10

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2255	Serial No: 2255-100519
Microphone:	Brüel & Kjær	4966	Serial No: 3412904
Preamplifier:	Brüel & Kjær	ZC-0043	Serial No: 3409272
Supplied Calibrator:	Brüel & Kjær	4231	Serial No: 3033154
Software version:	FW-2255-000 Version 1.3.0.478		

CLIENT: Harris Miller Miller & Hanson Inc.
700 District Avenue Suite 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Preconditioning: 4 hours at 23 ± 3 °C
Environment conditions See actual values in Environmental Condition sections

SPECIFICATIONS:

This document certifies that the instrument as listed under "Model/Serial Number" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. Statements of compliance, where applicable, are based on calibration results falling within specified criteria with no reduction by the uncertainty of the measurement. The calibration of the listed instrumentation, was accomplished using a test system which conforms with the requirements of ISO/IEC 17025, ANSI/NCCL Z540-1, and ISO 10012-1. For "as received" and/or "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without the written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. This instrument has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE:

Hottinger Brüel & Kjær Model 3630 Sound Level Meter Calibration System Software 7763 Version 8.6 - DB: 8.60 Test Collection 2255-N, 4966 (BZ-7300).

RESULTS:

As Received Condition	As Received Data	Final Data
X Received in good condition	_X_ Within acceptance criteria	_X_ Within acceptance criteria

Date of Calibration: 31 Jul. 2025

Certificate issued: 31 Jul. 2025

John Avitabile

Calibration Technician

Grant Kennedy
Quality Representative



Calibration
Certificate
1568.01

CERTIFICATE OF CALIBRATION

No.: 439814-701

Page 1 of 4

CALIBRATION OF:

Microphone: Brüel & Kjær Type 4966-Z-041 Serial No. 3412904

CUSTOMER:

Harris Miller Miller & Hanson, Inc
700 District Ave, Ste 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Environment conditions: Air temperature: 22.5 °C
 Air pressure: 97.94 kPa
 Relative Humidity: 52.5 %RH
Applied polarization voltage: 0 Vdc

SPECIFICATIONS: This document certifies that the instrument as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Hottinger Brüel & Kjær Inc. utilizes a simple acceptance decision rule as defined by ILAC G8 with measurement uncertainty value which will not exceed 50% of the tolerance. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE: The measurements have been performed with the assistance of the Hottinger Brüel & Kjær Inc. Microphone Calibration System B&K 9721 with application software WT9649 and WT9650 version 5.3.0.11 using calibration procedure: 4966-Z-041

RESULTS:

☒ "As Received" Data: Within Acceptance Criteria ☐ "As Received" Data: Outside Acceptance Criteria
☒ "Final" Data : Within Acceptance Criteria ☐ "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k=2$ providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from standards, calibration method, effect of environmental conditions and any short-term contribution from the device under calibration.

Date of Calibration: 31 July, 2025

Certificate issued: 31 July, 2025

Grant Kennedy

Can Phan
Calibration Technician

Quality Representative



Calibration
Certificate
1568.01

CERTIFICATE OF CALIBRATION

No.: 439814-702

Page 1 of 2

CALIBRATION OF:

Calibrator:	Brüel & Kjær	Type	4231	Serial No.:	3033154
		IEC Class:	1		

CUSTOMER:

Harris Miller Miller & Hanson, Inc
700 District Ave, Ste 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	22.9 °C
	Air pressure:	98.02 kPa
	Relative Humidity:	52.6 %RH

SPECIFICATIONS: This document certifies that the acoustic calibrator as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Hottinger Brüel & Kjær Inc. utilizes a simple acceptance decision rule as defined by ILAC G8 with measurement uncertainty value which will not exceed 50% of the tolerance. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Hottinger Brüel & Kjær Inc. Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants. The acoustic calibrator has been calibrated in accordance with the requirements as specified in IEC60942.

PROCEDURE: The measurements have been performed with the assistance of Hottinger Brüel & Kjær Inc. acoustic calibrator calibration application Software version 2.3.4 Type 7794 using calibration procedure 4231 Complete

RESULTS:

☒ "As Received" Data: Within Acceptance Criteria	☐ "As Received" Data: Outside Acceptance Criteria
☒ "Final" Data : Within Acceptance Criteria	☐ "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the calibrator under calibration.

Date of Calibration: 1 August, 2025

Certificate issued: 1 August, 2025

Can Phan
Calibration Technician


Grant Kennedy
Quality Representative



The Hottinger Brüel & Kjær Calibration Laboratory
3079 Premiere Parkway Suite 120
Duluth, GA 30097
Telephone: 770/209-6907
Fax: 770/447-4033
Web site address: <http://www.hbkworld.com>



CERTIFICATE OF CALIBRATION

Certificate No: 439818-101

Page 1 of 10

CALIBRATION OF:

Sound Level Meter:	Brüel & Kjær	2255	Serial No: 2255-100518
Microphone:	Brüel & Kjær	4966	Serial No: 3412903
Preamplifier:	Brüel & Kjær	ZC-0043	Serial No: 3409268
Supplied Calibrator:	Brüel & Kjær	4231	Serial No: 3033068
Software version:	FW-2255-000 Version 1.3.0.478		

CLIENT: Harris Miller Miller & Hanson Inc.
700 District Avenue Suite 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Preconditioning: 4 hours at $23 \pm 3^\circ\text{C}$
Environment conditions See actual values in Environmental Condition sections

SPECIFICATIONS:

This document certifies that the instrument as listed under "Model/Serial Number" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95%. Statements of compliance, where applicable, are based on calibration results falling within specified criteria with no reduction by the uncertainty of the measurement. The calibration of the listed instrumentation, was accomplished using a test system which conforms with the requirements of ISO/IEC 17025, ANSI/NCSL 2540-1, and ISO 10012-1. For "as received" and/or "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without the written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. This instrument has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE:

Hottinger Brüel & Kjær Model 3630 Sound Level Meter Calibration System Software 7763 Version 8.6 - DB: 8.60 Test Collection 2255-N, 4966 (BZ-7300).

RESULTS:

As Received Condition	As Received Data	Final Data
X Received in good condition	_X_ Within acceptance criteria	_X_ Within acceptance criteria

Date of Calibration: 31 Jul. 2025

Certificate issued: 31 Jul. 2025

John Avitabile

Calibration Technician

Grant Kennedy
Quality Representative



Calibration
Certificate
1568.01

CERTIFICATE OF CALIBRATION

No.: 439818-701

Page 1 of 4

CALIBRATION OF:

Microphone: Brüel & Kjær Type 4966-Z-041 Serial No. 3412903

CUSTOMER:

Harris Miller Miller & Hanson, Inc
700 District Ave, Ste 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	22.5 °C
	Air pressure:	97.94 kPa
	Relative Humidity:	52.5 %RH
Applied polarization voltage:	0 Vdc	

SPECIFICATIONS: This document certifies that the instrument as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Hottinger Brüel & Kjær Inc. utilizes a simple acceptance decision rule as defined by ILAC G8 with measurement uncertainty value which will not exceed 50% of the tolerance. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Hottinger Brüel & Kjær Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants.

PROCEDURE: The measurements have been performed with the assistance of the Hottinger Brüel & Kjær Inc. Microphone Calibration System B&K 9721 with application software WT9649 and WT9650 version 5.3.0.11 using calibration procedure: 4966-Z-041

RESULTS:

☒ "As Received" Data: Within Acceptance Criteria	☐ "As Received" Data: Outside Acceptance Criteria
☒ "Final" Data : Within Acceptance Criteria	☐ "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k=2$ providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from standards, calibration method, effect of environmental conditions and any short-term contribution from the device under calibration.

Date of Calibration: 31 July, 2025

Certificate issued: 31 July, 2025

Grant Kennedy

Can Phan
Calibration Technician

Quality Representative



Calibration
Certificate
1568.01

CERTIFICATE OF CALIBRATION

No.: 439818-702

Page 1 of 2

CALIBRATION OF:

Calibrator:	Brüel & Kjær	Type	4231	Serial No.:	3033068
		IEC Class:	1		

CUSTOMER:

Harris Miller Miller & Hanson, Inc
700 District Ave, Ste 800
Burlington, MA 01803

CALIBRATION CONDITIONS:

Environment conditions:	Air temperature:	22.9 °C
	Air pressure:	98.02 kPa
	Relative Humidity:	52.6 %RH

SPECIFICATIONS: This document certifies that the acoustic calibrator as listed under "Type" has been calibrated and unless otherwise indicated under "Final Data", meets acceptance criteria as prescribed by the referenced Procedure. Hottinger Brüel & Kjær Inc. utilizes a simple acceptance decision rule as defined by ILAC G8 with measurement uncertainty value which will not exceed 50% of the tolerance. The calibration of the listed transducer was accomplished using a test system which conforms to the requirements of ISO/IEC 17025, ANSI/NCSL Z540-1, and guidelines of ISO 10012-1. For "as received" and "final" data, see the attached page(s). Items marked with one asterisk (*) are not covered by the scope of the current A2LA accreditation. This Certificate and attached data pages shall not be reproduced, except in full, without written approval of the Hottinger Brüel & Kjær Inc. Calibration Laboratory-Duluth, GA. Results relate only to the items tested. The transducer has been calibrated using Measurement Standards with values traceable to the National Institute of Standards and Technology, National Measurement Institutes or derived from natural physical constants. The acoustic calibrator has been calibrated in accordance with the requirements as specified in IEC60942.

PROCEDURE: The measurements have been performed with the assistance of Hottinger Brüel & Kjær Inc. acoustic calibrator calibration application Software version 2.3.4 Type 7794 using calibration procedure 4231 Complete

RESULTS:

☒ "As Received" Data: Within Acceptance Criteria	☐ "As Received" Data: Outside Acceptance Criteria
☒ "Final" Data : Within Acceptance Criteria	☐ "Final" Data : Outside Acceptance Criteria

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the calibrator under calibration.

Date of Calibration: 1 August, 2025

Certificate issued: 1 August, 2025

Can Phan
Calibration Technician


Grant Kennedy
Quality Representative